

## Using a Bore Sight Camera as an AR&D Sensor, Phase II

Completed Technology Project (2009 - 2011)



### Project Introduction

This Phase II SBIR project will provide real time, relative six Degree of Freedom (6DoF) information to the crew of the ORION for docking. Our technical innovation performs optimized correlation (ULTOR

REG

), using video from the centerline (boresight) camera, to accurately locate features of interest, and marry that with a passive pose and position algorithm (ULTOR

REG

P3E) to accurately measure relative position and pose. In Phase II this ULTOR

REG

P3E process will be ported to an ORION VPU emulator, integrated with a centerline camera emulator, and demonstrated in a hardware in the loop (HWIL) docking experiment. The benefits of this program include: No additional weight or volume added to the weight constrained ORION baseline design. A backup docking sensor capability using different physics. The sensor output data will serve as an astronaut aid, working with the same imagery the astronaut views, and providing calibrated measurements. The sensor can work with Star Tracker imagery for long range relative navigation. The sensor data can be used directly with the Orion control system, allowing the astronaut to serve a supervisory role, relieving workload. Supports Lunar orbit docking (uncrewed Orion). Compatible with future robotic missions and robotic systems.

### Anticipated Benefits

The proposed system has the following Non-NASA applications: Satellite servicing Commercial Space Georegistration Robotic Assembly Security systems DOD-Operationally Responsive Space (ORS) DOD black programs The proposed system supports the Exploration initiative and has the following NASA applications: Orion crew aid and backup system for docking COTS station keeping/berthing to resupply the ISS Future Hubble deorbit or servicing missions Earth orbit rendezvous for lunar transfer Lunar orbit rendezvous for return to Earth Lunar landing (georegistration with landing site maps) MARS rendezvous, landing and return



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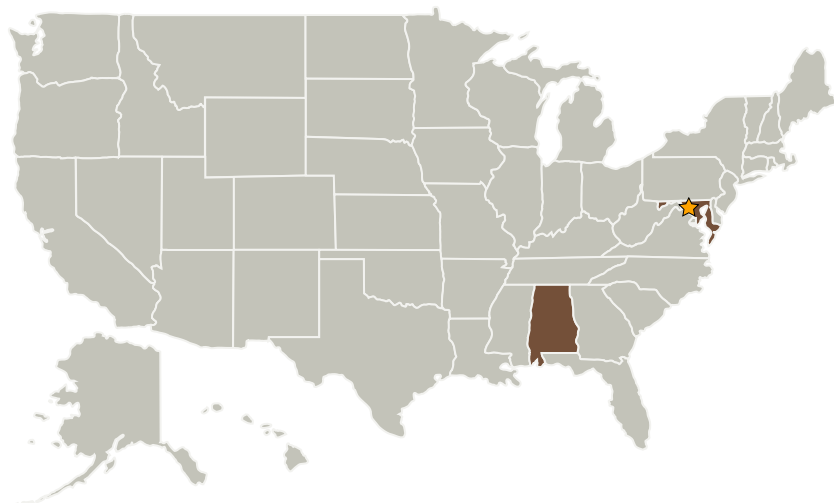
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Advanced Optical Systems, Inc.	Supporting Organization	Industry	Huntsville, Alabama

Co-Funding Partners	Type	Location
Army	US Government	Washington, District of Columbia

Primary U.S. Work Locations	
Alabama	Maryland

## Project Transitions

▶ **January 2009:** Project Start

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Project Manager:**

Scott P Cryan

**Principal Investigator:**

Fred Roe

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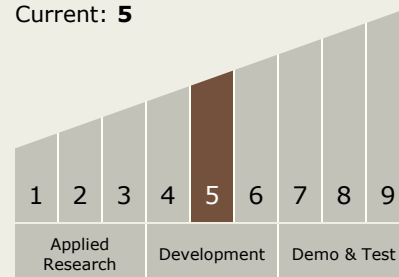
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**November 2011:** Closed out

### Technology Maturity (TRL)

Start: **5**  
Current: **5**



### Technology Areas

#### Primary:

- TX04 Robotic Systems
  - └ TX04.5 Autonomous Rendezvous and Docking
    - └ TX04.5.1 Relative Navigation Sensors